

REMARKS

Summary of the Office Action

Claims 1, 5, 7, 14, 18, and 19 stand rejected under 35 U.S.C. § 102(b) as being anticipated Grill et al. (US 6,140,226).

Claims 1, 2, 4-6, 8, 9, 13, and 15-17 stand rejected under 35 U.S.C. § 102(e) as being anticipated Chang et al. (US 6,365,506).

Claim 10 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Grill et al. in view of Yang et al. (US 6,162,587).

Claims 11 and 12 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Grill et al. in view of Lee et al. (US 6,300,238).

Claim 3 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Chang et al. in view of Tang (US 6,143,649).

Claim 15 stands rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the enablement requirement.

Claims 4, 8, 9, and 13 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite.

Claim 1 is objected to for minor informalities.

The specification is objected to for failing to provide proper antecedent basis for the claimed subject matter.

Summary of the Response to the Office Action

Applicant has amended claims 1, 5, 7, 8, 15, and 16, and canceled claims 2-4 and 17. Accordingly, claims 1, 5-16, 18, and 19 are pending for consideration.

Objection to the Specification

The specification is objected to for failing to provide proper antecedent basis for the claimed subject matter. Specifically, the specification fails to properly disclose features of claim 3. Applicant has canceled claim 3, thereby rendering the objection moot. Accordingly, Applicant respectfully requests that the objection to the specification be withdrawn.

Objection to the Claims

Claim 1 is objected to for minor informalities. Specifically, the Office Action alleges that claim 1 recites features that are “considered to be inconsistent terminology.” Accordingly, Applicant has amended claim 1 in accordance with the Examiner’s suggestions. Thus, Applicant respectfully requests that the objection to claim 1 be withdrawn.

All Claims Comply with 35 U.S.C. § 112

Claim 15 stands rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the enablement requirement. Specifically, the Office Action alleges that “[w]hile the specification provide[s] support for ‘etching the inter-metal dielectric using a plasma including a first activated CaFb + CxHyFz...’, the specification does not provide support for the limitation ‘wherein the inter-metal dielectric is formed by using a plasma including a first activated CaFb + CxHyFz...’” Accordingly, Applicant has amended claim 15 to comply with 35 U.S.C. § 112, first paragraph. Thus, Applicant respectfully requests that the rejection of claim 15 under 35 U.S.C. §

112, first paragraph, be withdrawn.

Claims 4, 8, 9, and 13 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. Specifically, the Office Action alleges that “[t]he term ‘minimum thickness’ in claims 4, 8-9, and 13 is a relative term which renders the claims indefinite.” Accordingly, Applicant has canceled claims 4, 8, 9, and 13, thereby rendering the rejection under 35 U.S.C. § 112, second paragraph, moot. Thus, Applicant respectfully request that the rejection of claims 4, 8, 9, and 13 stand rejected under 35 U.S.C. § 112, second paragraph, be withdrawn.

All Claims Define Allowable Subject Matter

Claims 1, 5, 7, 14, 18, and 19 stand rejected under 35 U.S.C. § 102(b) as being anticipated Grill et al. (US 6,140,226), claim 10 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Grill et al. in view of Yang et al. (US 6,162,587), and claims 11 and 12 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Grill et al. in view of Lee et al. (US 6,300,238).

Applicant respectfully traverses these rejection as being based upon combinations of prior art references that neither teach nor suggest the novel combination of features recited in amended independent claims 1 and 5, and hence dependent claims 7, 10-12, 14, 18, and 19.

Independent claims 1 and 5 both recite, in part, a step including forming/depositing a second hard mask material layer “on an entire surface of the inter-metal dielectric with a metallic material identical to that of the first hard mask material layer, wherein the second hard mask

material layer is deposited on an inner sidewall in the shape of a spacer within the first region of the first hard mask material layer to form a curved surface.” In contrast to Applicant’s claimed invention, Grill et al. teaches a lithographic method for forming a dual relief pattern on a substrate using a twice patterned single mask layer dual damascene process including an easy-to-integrate sidewall liner to protect organic interlevel and intralevel dielectrics from potential damage induced by photoresist stripping steps during lithographic rework. In addition, Grill et al. teaches a method for forming a dual pattern hard mask which may be used to form dual relief cavities for use in dual damascene processing, wherein the dual pattern hard mask comprises a first set of one or more layers having a first pattern and a second set of one or more layers having a second pattern.

Accordingly, Applicant respectfully asserts that Grill et al. neither teaches nor suggests a step of forming a second hard mask material later on an entire surface of an inter-metal dielectric “with a metallic material identical to that of the first hard mask material layer, wherein the second hard mask material layer is deposited on an inner sidewall in the shape of a spacer within the first region of the first hard mask material layer to form a curved surface,” as recited by independent claims 1 and 5, as amended, and hence dependent claims 6-15, 18, and 19.

Applicant further asserts that the Office Action does not rely on Yang et al. and/or Lee et al. to remedy the deficiencies of Grill et al. Moreover, Applicant respectfully asserts that Yang et al. and/or Lee et al. cannot remedy the deficiencies of Grill et al.

Furthermore, Applicant respectfully submits that dependent claims 7, 10-12, 14, 18, and 19 are allowable for all of the reasons discussed above with regard to independent claims 1 and

5, from which they depend, as well as the individual features each of dependent claims 7, 10-12, 14, 18, and 19 recite.

For the above reasons, Applicant respectfully asserts that the rejections under 35 U.S.C. §§ 102(b) and 103(a) should be withdrawn because neither Grill et al., Yang et al. and/or Lee et al., whether taken singly combined, teach or suggest the novel combination of features recited in amended independent claim 1 and 5, and hence dependent claims 6-15, 18, and 19.

Claims 1, 2, 4-6, 8, 9, 13, and 15-17 stand rejected under 35 U.S.C. § 102(e) as being anticipated Chang et al. (US 6,365,506), and claim 3 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Chang et al. in view of Tang (US 6,143,649).

Applicant respectfully traverses these rejection as being based upon combinations of prior art references that neither teach nor suggest the novel combination of features recited in amended independent claims 1 and 5, and hence dependent claims 7, 10-12, 14, 18, and 19.

Independent claims 1 and 5 both recite, in part, a step including forming/depositing a second hard mask material layer “on an entire surface of the inter-metal dielectric with a metallic material identical to that of the first hard mask material layer, wherein the second hard mask material layer is deposited on an inner sidewall in the shape of a spacer within the first region of the first hard mask material layer to form a curved surface.” In contrast to Applicant’s claimed invention, Chang et al. teaches a dual damascene process with porous low-k dielectric material including steps of forming a second insulating layer of a first material on a first insulating layer of a second material different from the first material, wherein both the first and second insulating layers are used as a hard mask. In addition, Chang et al. teaches using the second insulating layer

as a second pattern for defining a second opening in the low-k dielectric layer. Accordingly, Chang et al. teaches performing at least one etch to form a dual damascene structure in the porous low-k dielectric layer using the first and second insulating layers. Thus, Chang et al. teaches using the first and second insulating layers to provide different protection times in the etching the porous low-k dielectric layer.

Accordingly, Applicant respectfully asserts that Chang et al. neither teaches nor suggests a step of forming a second hard mask material later on an entire surface of an inter-metal dielectric “with a metallic material identical to that of the first hard mask material layer, wherein the second hard mask material layer is deposited on an inner sidewall in the shape of a spacer within the first region of the first hard mask material layer to form a curved surface,” as recited by independent claims 1 and 5, as amended, and hence dependent claims 6-15, 18, and 19.

Applicant further asserts that the Office Action does not rely on Tang to remedy the deficiencies of Chang et al. Moreover, Applicant respectfully asserts that Tang cannot remedy the deficiencies of Chang et al.

Furthermore, Applicant respectfully submits that dependent claims 7, 10-12, 14, 18, and 19 are allowable for all of the reasons discussed above with regard to independent claims 1 and 5, from which they depend, as well as the individual features each of dependent claims 7, 10-12, 14, 18, and 19 recite.

For the above reasons, Applicant respectfully asserts that the rejections under 35 U.S.C. §§ 102(b) and 103(a) should be withdrawn because neither Chang et al. and/or Tang, whether taken singly combined, teach or suggest the novel combination of features recited in amended

independent claim 1 and 5, and hence dependent claims 6-15, 18, and 19.

For at least the above reasons, Applicant respectfully submits that claims 1, 5-16, 18, and 19 are neither taught nor suggested by any of the applied prior art, whether taken alone or in combination. Applicant respectfully asserts that the rejections under 35 U.S.C. §§§ 102(b), 102(e), and 103(a) should be withdrawn because the above-discussed novel combination of features are neither taught nor suggested by any of the applied references, whether taken alone or in combination.

CONCLUSION

In view of the foregoing, Applicant respectfully requests reconsideration and the timely allowance of the pending claims. Should the Examiner feel that there are any issues outstanding after consideration of the response, the Examiner is invited to contact the Applicant's undersigned representative to expedite prosecution.

If there are any other fees due in connection with the filing of this response, please charge the fees to our Deposit Account No. 50-0310. If a fee is required for an extension of time

under 37 C.F.R. § 1.136 not accounted for above, such an extension is requested and the fee should also be charged to our Deposit Account.

Respectfully submitted,

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